parts of South Australia. "It grows terrestrially in seasonal swamps during the period of winter rainfall. During the dry summer it aestivates, as do the other geophytes with which it is associated." The stock is buried, and during the vegetative season only a small rosette of linear leaves is visible above the soil. On approach of the dry season, the leaves dry up and become detached, leaving their tough bases and sporangia upon the stock, wholly buried and invisible.

This species seems to be unique among Pteridophytes in its method of spore liberation. There is a special mechanism for freeing the spores which depends for its action upon saturation with water, not upon dryness (as in other Pteridophytes). Other peculiar features of the species are in the nature of preparation for this remarkable method of spore dispersal. In his summary, OSBORN describes the performance as follows: "Early in the rainy season, the hardened bases of the sporophylls are forced above the surface of the soil in a projectile-like mass, carrying with them the sporangia, by the expansion of certain pads of mucilage cells formed at the close of the previous vegetative season on the extreme bases of the sporophylls and from the superficial cells of the leaf-bearing cortex. About the same time the leaves of the new vegetative season begin to appear. The imbricate mass of sporophyll bases breaks up upon the surface of the soil, and the spores are set free by a tearing away of the sporangium wall from its attachment to the sporophyll when sodden. This is due to a difference between the tension of the inner and outer surfaces of the sporangium wall when saturated, and results in an eversion of the wall."

TAKAMINE[10] has investigated the gametophytes of *Isoetes japonica* and *I. asiatica*, with some interesting results. The female gametophyte of *I. japonica* usually has five or six archegonia, but sometimes ten or more. When fertilization occurs in one of them, the others degenerate; but in rare cases when fertilization occurs in two or more archegonia, several embryos are developed up to certain stages. Occasionally megaspores and microspores were found in the same sporangium. In *I. asiatica* the *2x* chromosome number is twenty-two, while in *I. japonica* it is "forty-three to forty-five." Hybrids of the two species were produced, an account of which is promised later.—J. M. C.

Complexmutation.—As the term mutation is now being used by geneticists, its application is restricted to "locus changes" on the chromosomes. At one place on one chromosome, mutation takes place, the effect of the change being so restricted as to involve only a single factor; other factors, although lying very close on the same chromosome, remain unchanged. Save for "deficiency," noted by BRIDGES[11] (which is evidently of a different category), all mutation seems to have been of this very localized type. It is perhaps surprising that no clear cases of mutations involving simultaneous changes in

[10] TAKAMINE, N., Some observations in the life history of *Isoetes*. Bot. Mag. Tokyo **35**: 184–190. *figs. 9*. 1921.

[11] BRIDGES, C. B., Deficiency. Genetics **2**: 445–465. 1917.

several factors in one region of a chromosome have been discovered. NILSSON-EHLE[12] now claims to have such a case, and calls it "complexmutation." Normal wheat mutates to bearded speltoid, involving a simultaneous change in two closely linked factors. Among the F_2 progeny of normal×mutant appear a few bearded normal type and beardless speltoid, but only a very few, due to the very close linkage of the two mutated factors. In another case the investigator claims that three linked factors have mutated simultaneously.—M. C. COULTER.

Ozark forests.—The Ozark region, as covered by PALMER[13] in this reconnoissance, is defined as occupying the southern half of Missouri, a narrow spur crossing southern Illinois, the northwestern part of Arkansas, and a long triangular strip in eastern Oklahoma. The two topographic divisions of this uplifted region, lying midway between the higher mountains of the east and west, are the flat-topped dome of the northern plateau with an average altitude of 300–500 m., and the southern Boston Mountains with a few points above 600 m. It is a hill region surrounded by fertile plains, and possessing a rather abundant rainfall. Floristically there are no distinct floras corresponding to the topographic divisions, although the southern parts of the region, including the Boston Mountains, have a heavier forest growth richer in types than the northern, and include such southern forms as *Aesculus discolor*, *Tilia floridana*, *Rhamnus caroliniana*, *Ilex decidua*, and *Magnolia acuminata*.

The larger portion of the report is occupied by floristic notes on various sections of the flora and on certain genera and species. The author is convinced that in the region as a whole there is a demonstration of the gradual but actual encroachment of forest upon prairie lands.—GEO. D. FULLER.

Temperature and nodule development.—Using soil temperatures ranging from 12° to as high as 40° C., JONES and TISDALE[14] have studied the effect of these temperatures on the development of nodules by alfalfa, red clover, soy beans, and field peas. The results as to the number of nodules developed were not so very consistent, but when the dry weight of the nodules was determined, it was found that the greatest development, in the case of the soy bean, was at 24° C. This effect of temperature on nodule development is not correlated with a corresponding effect on root and shoot development. It is pointed out in the paper that the real question in a study of this kind is not the effect of temperature on the number of nodules developed by the plants, or on the volume of these nodules, but the effect on the amount of nitrogen fixed in the nodules.

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[12] NILSSON-EHLE, H., Multiple Allelomorphe und Komplexmutationen beim Weizen. Hereditas 1:277–311. 1920.

[13] PALMER, E. J., The forest flora of the Ozark region. Jour. Arnold Arboretum 2:216–232. 1921.

[14] JONES, F. R., and TISDALE, W. B., Effect of soil temperature upon the development of nodules on the roots of certain legumes. Jour. Agric. Res. 22:17–31. *pls. 1–3.* 1921.